

# ARCHIVED REPORT

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## Mortars (United States)

### Outlook

- U.S. activity focused on modernization, retrofit, and resupply of existing mortar systems
- U.S. Marine Corps' EFSS production was reportedly completed in 2012
- Production of 60mm, 81mm, and 120mm mortars will continue at low levels

### Orientation

**Description.** High-angle, short-range artillery systems.

**Sponsor.** The U.S. Army sponsors the development and procurement of mortars in the United States.

**Licensee.** A number of nations produce older U.S.-pattern mortars under license.

**Status.** Development through as-needed serial production.

**Total Produced.** Through 2023, FI estimates the U.S. Department of Defense procured at least 8,900 mortars of all types since 1980 inclusive.

**Application.** Mortars provide highly flexible, short-range indirect fire support for the infantry, independent of and complementary to field artillery.

**Price Range.** According to U.S. Army budget request documentation, major components of U.S. mortar systems carry the following unit prices:

- 60mm M224A1 mortar tube: \$35,000
- 60mm M224A1 mortar components: \$60,184
- 60mm M224A1 mortar system: \$22,259
- 81mm M252A1 mortar tube: \$28,950
- 81mm M252A1 mortar components: \$47,528
- 81mm M252A1 mortar system: \$16,371
- 120mm M120A1/M121A1 mortar tube: \$60,011
- 120mm M120A1/M121A1 mortar components: \$18,371
- 120mm M120A1 mortar system: \$210,600
- 120mm M121A1 mortar system: \$150,000

**Mortars (United States)****Contractors****Prime**

<b>Airbus SE</b>	http://www.airbus.com, Mendelweg 30, PO Box 32008, Leiden, Netherlands, Tel: + 31 71 52 456 00, Fax: + 31 71 52 328 07, Prime
<b>BAE Systems plc</b>	http://www.baesystems.com, 6 Carlton Gardens, Stirling Sq, London, United Kingdom, Tel: + 44 1252 373232, Fax: + 44 1252 383991, Prime
<b>Dynamic Flowform</b>	http://www.atimetals.com, 12 Suburban Park Dr, Billerica, MA 01821-3998 United States, Tel: + 1 (978) 667-0202, Fax: + 1 (978) 667-3812, Email: mfonte@flowform.com, Prime
<b>Elbit Systems Ltd</b>	http://elbitsystems.com, Advanced Technology Center, PO Box 539, Haifa, Israel, Tel: + 972 77 294 0000, Fax: + 972 77 295 0000, Email: info@elbitsystems.com, Prime
<b>General Dynamics Ordnance and Tactical Systems</b>	http://www.gd-ots.com, 100 Carillon Parkway, St. Petersburg, FL 33716 United States, Tel: + 1 (727) 578-8100, Fax: + 1 (727) 578-8119, Email: mediacontact@gd-ots.com, Prime
<b>Watervliet Arsenal</b>	1 Buffington St, Watervliet, NY 12189-4050 United States, Tel: + 1 (518) 266-5111, Email: swantek@wva.army.mil, Prime

Contractors are invited to submit updated information to Editor, International Contractors, Forecast International, 75 Glen Road, Suite 302, Sandy Hook, CT 06482, USA; rich.pettibone@forecast1.com

**Technical Data**

The following mortars are currently in U.S. Army and Marine Corps inventories (note that the 60mm M224 and 81mm M252 mortars have replaced the 60mm M19 and 81mm M29/M29A1 mortars, respectively, in active service):

<u>Designation</u>	<u>Description</u>
M19	60mm Mortar
M224	60mm Lightweight Company Mortar System
M29	81mm Mortar
M252	81mm Battalion Mortar System (Medium Extended-Range Mortar)
M30	4.2-inch (107mm) Heavy Mortar
M120/M121	120mm Battalion Mortar System

	<u>M19</u>	<u>M224</u>	<u>M29/M29A1</u>	<u>M252</u>	<u>M30</u>	<u>M120/M121</u>
<b>Weight (kilograms)</b>						
Barrel	7.25	6.55	12.68	12.25	70.89	46.51
Bipod	7.42	6.91	14.09	11.79	76.55	31.50
Baseplate	5.79	6.55	11.30	11.34	87.42	62.01
Sight	0.57	1.14	2.37	1.14	2.48	1.55
<b>Total</b>	<b>21.03</b>	<b>21.15</b>	<b>40.44</b>	<b>36.52</b>	<b>237.34</b>	<b>141.57</b>
<b>Range (meters)</b>						
Maximum	1,771	3,600	4,595	5,600	6,840	6,250
Minimum	45	50	70	100-200	770	250

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### Variants/Upgrades

**Variants.** Not generally applicable. Mortar contractors usually give modified or upgraded models of their mortars new designations.

**Modernization and Retrofit Overview.** Other than for totally new designs, the primary enhancements related to mortars are in the field of ammunition. However, the U.S. Army continues to fund some upgrade mortar programs, as follows:

- Procurement of modified baseplate caps for 120mm M120/M121 mortars
- Procurement of M67 sight units for existing 60mm and 81mm mortar systems

The U.S. Army completed funding the procurement of 81mm subcaliber training devices for 120mm M120/M121 mortars in FY04.

### Program Review

**Background.** The mortar provides relatively short-range, organic indirect fire support for infantry units.

#### *The Rifleman's Artillery*

Infantry units at battalion level and below rely on this readily available organic fire support capability, as corps- and division-directed fire missions tend to monopolize brigade- and division-level field gun and howitzer artillery units.

The relatively low weight, high mobility, and range performance of most current-generation mortars make them ideal for frontline infantry indirect fire support. Mortars are extremely flexible weapons in terms of both range and capability. A variety of fuze and ammunition types enable mortars to fulfill most short-range offensive and defensive fire support requirements.

The U.S. Army and Marine Corps generally assign mortars to various echelons based on the mortar's caliber and range. Heavy mortars (107mm/4.2 in and 120mm) are battalion-level assets; medium mortars (81mm) are company-level weapons. The lightweight 60mm mortars are now almost exclusively light infantry weapons, employed at the company level by specialized light infantry units, such as the U.S. Army's 82nd Airborne Division and 101st Airborne Division (Air Assault), 173rd Airborne Brigade, and 75th Ranger Regiment (Airborne).

**Description.** The following mortars are currently in service with the U.S. Army and Marine Corps.

**60mm M19 Mortar.** This mortar, the immediate successor to the World War II-era M2 Brandt 60mm mortar, is long out of production. However, one can still find this simple, effective weapon in U.S. war reserve stocks; it remains in widespread use worldwide.

**60mm M224 LCMS.** Watervliet Arsenal produced this weapon to replace the older and heavier M29 81mm

mortar used by light infantry units. The Lightweight Company Mortar System consists of the M224 improved 60mm mortar, conventional fire control, and the M734 multi-option electronic time fuze (airburst, near-surface burst, surface burst, or delay). The M734 fuze replaces seven inventory fuzes. The Lightweight Company Mortar System weighs less than half the current 81mm mortar. Nevertheless, the M224 mortar retains 70 percent of the lethality of the heavier 81mm mortar per round of ammunition fired.

Procurement of the Lightweight Company Mortar System began in FY78 when the U.S. Army allocated \$3.4 million for the procurement of 190 mortars, followed by the final purchase of 1,400 mortars for \$9.6 million in FY79. In the same year, the U.S. Marine Corps allocated \$4.6 million for the procurement of 698 mortars. FI estimates the U.S. Department of Defense has procured at least 2,700 M224 mortars to date. Production occurs on an as-needed basis only.

**60mm M224A1 LCMS.** In June 2011, the U.S. Army began fielding the M224A1 with the 1st Special Forces Group (Airborne) in Fort Lewis, Washington. The M224A1 provides a 20 percent weight reduction over the legacy M224 LCMS. The M224A1 consists of the following components:

- M225A1 Tube. Made of Inconel (a nickel-based material), this tube is significantly lighter than a conventional steel tube.
- M170A1 Bipod. A completely redesigned bipod assembly, featuring a 17 percent weight reduction with its aluminum, titanium, and Kevlar components.
- M17A1 Baseplate.
- M8 Auxiliary Baseplate.
- M67 Sight Unit.

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The U.S. Army reportedly intends to eventually replace all existing M224 mortars with the M224A1.

**81mm M29 Mortar.** Another World War II-era design, the M29 is no longer in active U.S. service. The U.S. Army has replaced the M29 with the 60mm M224 in light infantry units and the 81mm M252 in mechanized infantry units. This tried-and-true old mortar is still in service with at least 34 nations worldwide.

**81mm M252 Mortar.** A part of the Battalion Mortar System, the M252 is a derivative of the British 81mm L16 mortar. The U.S. DoD initiated procurement in FY82 with the objective of replacing the existing 81mm M29 mortar on M125A1 tracked mortar carriers. The U.S. DoD justification for buying a British system was to support the U.S. commitment to enhancing the Rationalization Standardization Interoperability program with NATO allies. The complete M252 system consists of a British barrel with a blast attenuation device, mounted on a U.S.-design baseplate. The fire control components include the U.S.-pattern self-illuminating sight unit with aiming post lights and a lightweight aluminum aiming post.

On September 7, 1984, the U.S. Army concluded contract DAAK10-85C-0024 with Royal Ordnance, giving the United States a royalty-free license to produce the mortar and ammunition once RO had delivered 4,000 mortars and 2 million high-explosive rounds. On December 7, 1984, a subsequent contract required Royal Ordnance to deliver a technical data package for production of the mortar and ammunition six months after the date of contract award.

Because of budget cuts, the U.S. Army reduced its acquisition objective for the M252 mortar from 1,449 to 1,115 in FY88. To secure the production rights specified in the original contract, the U.S. Army purchased an equivalent dollar amount of ammunition (at FY85 contract prices) to substitute for the unprocured mortars. Consequently, the U.S. Army purchased an additional 426,087 HE mortar rounds (at GBP82.94 per round) in order to secure production rights from RO Defence.

Although the U.S. Army was supposed to have completed the procurement and deployment of the 81mm M252 mortar in September 1990, production continues on an as-needed basis. FI estimates Watervliet Arsenal has produced at least 1,193 M252 mortars for the Army to date.

**Medium Extended Range Mortar.** This is simply the U.S. Marine Corps designation for the 81mm M252 Battalion Mortar System procurement that began in FY87; the Marines completed MERM deployment in

September 1990. The Marine Corps procured 664 M252 mortars under the MERM program.

**4.2-inch (107mm) M30 Mortar.** The "Four-Deuce" has soldiered on as the infantry's battalion-level heavy mortar since its introduction during World War II. Since the 1960s, the U.S. Army has also employed the M30 mounted in the M106A1 tracked mortar carrier. Though not in production for several decades, the Four-Deuce is still in limited service with National Guard and Reserve units. In active-duty units, 120mm mortars have supplanted the M30.

**120mm M120/M121 BMS.** In November 1985, the U.S. Army issued a Request for Proposals (RFP) for a new 120mm mortar and ammunition system to replace the aging M30 4.2-inch (107mm) mortar. The new system had to provide the following improvements over the M30:

- High-explosive ammunition lethality and illumination
- Higher rates of fire
- An expanded range envelope
- Greater mobility (towed and tracked vehicle-mounted), consistent with the AirLand Battle doctrine

Army officials indicated that fielding a new 120mm mortar would require the type of training and support common to the existing 60mm and 81mm mortars, reducing costs through standardization. Additionally, U.S. deployment of a new 120mm mortar would enhance interoperability with NATO-standard systems already in use.

### *Selecting the Soltam K6*

In 1985, private industry was solicited to compete for production of the new mortar system. The U.S. Army Source Selection Evaluation Board used the results of the competitive tests to assess the technical and performance aspects of the contractors' proposed mortar systems. In March 1988, the board selected Martin Marietta's mortar system (the K6 from Soltam of Israel) as the M120/M121 Battalion Mortar System.

### *The Contractor Shuffle*

The 1987 Defense Authorization Act required the U.S. Army to conduct a cost comparison of potential 120mm systems. Congressional provisions of the 1989 Defense Authorization Act further directed the Army to perform an "Arsenal Act" analysis prior to obligating any FY89 funds for procurement of 120mm mortars. On December 14, 1988, the Army selected its Watervliet Arsenal (rather than Martin Marietta) to

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produce the 120mm mortar system based on the results of a cost comparison between Watervliet, with a cost estimate of \$44.7 million to produce 2,816 carrier-mounted and towed mortars, and Martin Marietta, with a firm-fixed-price offer of \$67.9 million to produce the same.

Although the U.S. Army awarded the contract to Watervliet Arsenal, Martin Marietta (subsequently Lockheed Martin and later, General Dynamics Armament and Technical Products) remains the program manager. General Dynamics has produced a number of components for the mortar system as a subcontractor to Watervliet Arsenal.

### *Budget Limitations*

Since the U.S. Army developed the original production plan in the 1980s, budgetary restraints constantly interfered with the procurement objectives, resulting in a truncated program. The procurement program officially ended in FY98, with a total procurement of 63 towed M120 and 1,081 carrier-mounted (in M1064A3 tracked carriers) M121 mortars. Since then, we estimate the Army has procured an additional 423 M121 mortars. Production is currently available on an as-needed basis.

The U.S. Army first fielded the M120 in September 1991; the M121 saw initial fielding in July 1996.

The Army's canceled 120mm Non-Line-of-Sight-Mortar (NLOS-M) was to have ultimately replaced the M121 system. The Army tested the first iterations of the NLOS-M concept with the 120mm Stryker Mortar Carrier Vehicle (the MCV-A and MCV-B); this program reportedly required 306 Israeli-made Soltam 120mm recoil-operated breech-loading mortars.

Expeditionary Fire Support System. In February 2005, the U.S. Marine Corps Systems Command (MARCORSYSCOM) in Quantico, Virginia, unveiled the Expeditionary Fire Support System, a 120mm towed rifled mortar system. The EFSS represents the third and final leg of the Marines' land-based fire support triad that includes the 155mm M777 Joint Lightweight Howitzer and the 227mm M142 High Mobility Artillery Rocket System (HIMARS).

### *Deployable Firepower*

As a Marine Air-Ground Task Force (MAGTF) direct support asset, the EFSS is deployable from amphibious ships and air-transportable internally in CH-53 helicopters and MV-22 Osprey tiltrotor aircraft. The 120mm rifled towed mortar fires NATO-standard smoothbore and rifled 120mm mortar rounds out to a range of 8,200 meters (8,967.5 yd); rocket-assisted rounds extend the range out to over 13,000 meters

(14,217 yd). Thus, the 120mm EFSS offers significant advantages over the heaviest mortar the Marines can currently deploy via the CH-53 or MV-22, the 81mm M252 Medium Extended Range Mortar, which features a maximum range of 5,600 meters (6,124 yd).

In 2001, the Marine Corps Combat Development Command (MCCDC) identified a need for an expeditionary fire support system to provide an all-weather, ground-based, immediately responsive, indirect fire support system for the Marine Air-Ground Task Force. MCCDC wanted a lighter, more mobile indirect fire capability, with greater agility and lethality than the existing M252 MERM. Although MCCDC issued the mission need statement in 2001, the Marine Corps Warfighting Lab had been experimenting with mortar designs for several years.

### *Urgent Combat Requirement*

When Gen. James L. Jones, (then) 32nd Commandant of the Marine Corps, directed a review of Marine Corps field artillery assets, one resulting idea was the Expeditionary Fire Support System. General Jones asserted that the U.S. Marine Corps had allowed its ground fire assets to atrophy to the point where Marines were outgunned and outranged by just about everyone.

In a 2002 summary report of Operation Enduring Freedom, a Marine Corps combat assessment team concurred with General Jones' assertion, noting that Marine Expeditionary Unit (MEU) commanders and their staff officers had clearly stated the need for a lighter, more mobile and lethal organic fire support system that is air-transportable by Marine aviation assets.

On November 10, 2004, following a series of competitive evaluations, MARCORSYSCOM awarded General Dynamics Ordnance and Tactical Systems a contract with an initial value of \$18.295 million for design and development of the EFSS and the Internally Transportable Vehicle (ITV). GDOTS was to act as systems integrator for the EFSS and ITV programs. Manufacturers employed by GDOTS as subcontractors on the EFSS program supplied the following products and services:

- TSA Armaments SAS (a joint venture of Thales Inc and EADS Deutschland GmbH) provided its 120mm RT 120 Rifled Mortar System.
- General Dynamics Canada provided the ballistic fire control computer.
- American Growler Inc (also known as Carolina Growler Inc) produced the EFSS ITV vehicles.

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- Tec-Masters Inc (Huntsville, Alabama) provided integrated logistical support.

The initial contract specified the production of three EFSSs and four ITVs by September 2005 under the System Development and Demonstration phase. The overall production contract for those systems carried a total value of \$296.3 million.

The EFSS consists of a towed RT 120 mortar and light wheeled prime mover, along with an ammunition resupply vehicle and trailer. Low-rate initial production of the EFSS commenced in 2006. The EFSS program completed production in 2012 for a truncated U.S. Marine Corps procurement objective of 66 systems (reduced from the original objective of 80 systems).

## Funding

The following table reflects U.S. Department of Defense FY24 budget request documentation (March 2023) for the procurement of mortar systems and components. All amounts are in millions of U.S. dollars.

<b>U.S. FUNDING</b>						
	FY20 <u>QTY</u>	FY20 <u>AMT</u>	FY21 <u>QTY</u>	FY21 <u>AMT</u>	FY22 <u>QTY</u>	FY22 <u>AMT</u>
<b>Procurement – U.S. Army</b>						
Mortar Systems	371	33.0	-	20.7	204	33.2
Mortar Modification	-	1.7	-	1.7	-	-
<b>Total</b>	<b>371</b>	<b>34.7</b>	<b>-</b>	<b>22.4</b>	<b>204</b>	<b>33.2</b>
	<u>FY23 QTY</u>	<u>FY23 AMT</u>	<u>FY24 QTY</u>	<u>FY24 AMT</u>	<u>FY25 QTY</u>	<u>FY25 AMT</u>
<b>Procurement – U.S. Army</b>						
Mortar Systems	6	8.5	6	8.0	6	8.5
Mortar Modification	-	-	-	0.4	-	-
<b>Total</b>	<b>6</b>	<b>8.5</b>	<b>6</b>	<b>8.4</b>	<b>6</b>	<b>8.5</b>
	<u>FY26 QTY</u>	<u>FY26 AMT</u>	<u>FY27 QTY</u>	<u>FY27 AMT</u>	<u>FY28 QTY</u>	<u>FY28 AMT</u>
<b>Procurement – U.S. Army</b>						
Mortar Systems	10	14.6	9	14.2	9	14.2
Mortar Modification	-	-	-	-	-	-
<b>Total</b>	<b>10</b>	<b>14.6</b>	<b>9</b>	<b>14.2</b>	<b>9</b>	<b>14.2</b>

## Timetable

Although EFSS procurement is complete for the U.S. Marine Corps, FI expects the next major procurement milestone to be the development and fielding of a 120mm mortar system to replace the U.S. Army's canceled 120mm NLOS-M program. In the meantime, the Stryker Mortar Carrier Vehicle program acts as an interim capability. The second-generation Stryker MCV-B, which can fire its 120mm M121 mortar from inside the vehicle, is currently in service with the U.S. Army's Stryker Brigade Combat Teams.

## Worldwide Distribution/Inventories

**Export Potential.** In addition to the U.S. Army and Marine Corps, a number of nations worldwide employ a variety of U.S.-pattern mortars. Sales have occurred via the Foreign Military Sales program and have been made by international principals and foreign license manufacturers.

**Countries.** Argentina, Australia, Austria, Belgium, Canada, Chile, Republic of China (Taiwan), Costa Rica, Denmark, Dominican Republic, Greece, Guatemala, Haiti, Indonesia, Iran, Italy, Japan, Republic of Korea, Liberia, Mexico, Morocco, the Netherlands, Norway, Oman, Panama, the Philippines, Portugal, Turkey, Vietnam, and Zaire. This listing is not all-inclusive.

**Mortars (United States)**

**Forecast Rationale**

U.S. Army and Marine Corps mortar procurement consists primarily of components for modernization and retrofit of existing weapons systems.

***Glacial Development Process***

In comparison with advances in other types of U.S. infantry armament, the development and procurement of mortars continue to be glacially slow. Mortars are perhaps the most simple and effective fire support weapons available to the infantryman. That there has

been so little real change in basic mortar design since World War II clearly verifies the simplicity and effectiveness of the existing models. Any developments that have occurred primarily involved weight reduction, ancillary equipment, and ammunition improvements.

Forecast International expects that low-level production of 60mm, 81mm, and 120mm mortars – to meet U.S. Army and Marine Corps procurement requirements – will occur on an as-needed basis only.

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